

possible to grow two cereal crops each season—wheat from November to July and maize from July to October. The results show that the average yield of wheat is a good deal lower than in England, for instance; but the two crops taken together furnish an amount of grain in excess of the yields of the single crops obtained in England, Germany and the north of France. The character of the climate of Suessola is further illustrated by the fact that Rabi wheat from Oudh tends to give increased crops when grown in this district. English wheat, on the other hand, was found to deteriorate.

As regards the effect of the different manures on the wheat crop, horse-dung with sulphate of ammonia, applied in the spring, gave the highest yield, both of grain and straw. Sulphate of ammonia alone, applied in the spring, gave a higher yield of grain, but less straw than when applied partly in the autumn and partly in the spring; this result is attributed to the excessive rainfall during the winter months. With nitrate of soda there was a much lower yield of grain and rather less straw than with sulphate of ammonia. In accordance with what has been observed at Rothamsted and at Woburn, Giglioli obtained a greater weight per bushel under the influence of sulphate of ammonia than with nitrate of soda. Both these manures proved to be very effective when applied in conjunction with horse-dung. In this connection it may be mentioned that, quite recently, Hiltner has found that when humous sandy soil and heavy soil were inoculated with certain denitrifying organisms an increased production of oats was obtained. These results lend support to the view, now very generally accepted, that, in practice, the danger of any considerable loss of nitrogen under the influence of denitrifying organisms has been a good deal over-estimated.

Basic slag alone very considerably increased the yield of wheat grain; a still further increase in grain and also in straw was obtained when horse manure, or a mixture of sulphate of ammonia, nitrate of soda and potassium chloride were applied in addition to basic slag. Exclusively nitrogenous manures in addition to basic slag yielded about the same amount of grain, but more straw, than basic slag alone. Mineral superphosphate gave less satisfactory results than basic slag. Leucite, which occurs in large quantities in Italy, especially Roccamonfina, increased the yield of wheat when applied along with nitrate of soda; in conjunction with basic slag and nitrogenous manures, it produced about the same effect as potassium chloride under the same conditions.

Some interesting results are recorded on the effect of manganese dioxide, applied with various manures. These experiments, which have now been continued for three years, tend to show, in the majority of cases, that manganese dioxide in some way benefits the wheat crop. Further experiments on the subject, in which other crops, such as mangels, might be included, are desirable.

Electro-culture experiments with wheat manured with horse-dung showed a distinct gain both in grain and in straw when atmospheric electricity was employed, the increase in grain being relatively the greater. Voltaic electricity produced a still more marked effect, and increased the yield both of grain and straw by about 10 per cent.

It has not been possible within the limits of this short
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notice to give much more than a general indication of the lines of Prof. Giglioli's carefully conducted series of experiments, which, as time goes on, cannot fail to gain in interest and value. The present Report is well arranged for reference, and contains excellent bibliographies of some of the subjects investigated. The second Report, dealing with the results of the maize experiments, will, it is hoped, be ready before very long. N. H. J. M.

EARTH CURRENT MEASUREMENTS.

Die Erdströme im Deutschen Reichstelegraphengebiet und ihr Zusammenhang mit den Erdmagnetischen Erscheinungen. By Dr. B. Weinstein. Pp. vi + 78, and Atlas to ditto. (Brunswick: Friedrich Vieweg and Son, 1900.) Price, Mk. 4.

OF late years, when the interests of the electric railway and tramway have clashed with those of the observatories in which magnetic and earth current measurements are made, it has frequently been urged by the opponents of the observatories that they continue year after year accumulating data of which no use is ever made. Unfortunately, in most cases, owing, no doubt, to the very inadequate staff and multitudinous duties they have to perform, there is a certain amount of truth in this contention. It must, however, not be forgotten that the material is always available and can be worked up at any future date, while if the observations are interrupted, for however short a time, no amount of money or trouble expended at a subsequent time can replace the missing measurements. In this connection it is, therefore, with considerable pleasure that we welcome this pamphlet of nearly eighty pages, together with a quarto volume of curves, which give an account of the measurements made of the earth current curves obtained in two lines, one running between Berlin and Dresden, and the other between Berlin and Thorn during the epoch 1884-1888.

The author considers, in the first place, the manner in which the earth currents change, and in the second place to what extent these changes are connected with simultaneous changes in the terrestrial magnetic field.

In order to investigate the periodic changes in the earth currents, the ordinates of the photographic curves were measured for every hour and the means were used to calculate the coefficient of a Fourier expansion. The agreement between the values of the coefficients derived from the means for the various years is quite surprising considering the irregularity which one associates with all earth current phenomena.

The two lines being very nearly at right angles, and making the supposition that the current measured in the line is proportional to the current which traverses the earth, the author is able to calculate for each hour of the day the azimuth in which the current is flowing through the earth's crust. He compares the azimuth of this resultant current with the azimuth of the trace of the vertical plane passing through the sun. The results of these measurements, as well as a consideration of the way in which the earth currents change in magnitude and direction for the various months of the year, are all most clearly shown by means of vector diagrams. Vector diagrams are also given to show the changes in the earth's magnetic field for various stations, and a com-

parison between the two classes of curves shows a striking resemblance between their more salient features. It is quite impossible in such a notice as this to deal with the mass of data contained in the work, but we have no doubt that all interested in the fascinating subject of terrestrial magnetism will read the book with very great interest and feel, with the reviewer, that a great debt is due to Dr. Weinstein for the enormous amount of labour he has expended and for the satisfactory manner in which he has carried out his task.

OUR BOOK SHELF.

The Life of the Bee. By Maurice Maeterlinck. Translated by Alfred Sutro. Pp. 348. (London: George Allen, 1901.) 5s. net.

So far as our present knowledge extends, there are only four groups of animals which live in organised and more or less civilised communities at all resembling our own; and these are not mammals, or even vertebrates, as we might have been inclined to imagine *a priori*, but insects—ants, wasps, bees and termites. Hitherto entomologists have been inclined to award the palm of intelligence to the ants, but M. Maeterlinck thinks that the intelligence of the hive-bee has been somewhat underrated, at least as regards the readiness with which bees accept and adapt themselves to new conditions; and he also argues, as others have done before him, that the proceedings of human beings would probably appear far less intelligent to beings as far removed from man as man is from the bee, than do those of a bee-hive to ourselves. The book is not a romance in which bees are anthropomorphised, but an actual presentation of the life-history of the bee, and it appears to be abreast of the latest knowledge on the subject. The subject is discussed from the standpoint of a moderate agnosticism, and is interspersed with philosophical reflections on the various phases of bee-life as compared with human life, and of the equal mystery surrounding both. A fairly good list of some of the principal works on bees, in which English writers hold a very prominent position, is given at the end of the book. Incidentally, we are sorry to see the very unfavourable picture drawn, in § 94, of the peasantry of Normandy. We hope and believe that it is by no means universally applicable to the peasantry of other countries, including our own. As the work has doubtless been translated under the supervision of the author, it is probable that his meaning has been fairly grasped and expressed by his translator. As a specimen of the style of the book we may quote a short passage from pp. 302, 303: "Were an observer of a hundred and fifty times our height, and about seven hundred and fifty times our importance (these being the relations of stature and weight in which we stand to the humble honey-fly), one who knew not our language, and was endowed with senses totally different from our own; were such an one to have been studying us, he would recognise certain curious material transformations in the course of the last two-thirds of the century, but would be totally unable to form any conception of our moral, social, political, economic or religious problems." Here and there (as in the case of the word "importance" in the above passage) we find a word used which seems, from the context, hardly to express the author's meaning in English; and more rarely we find a technical error, as where *Sphinx Atropos* is once called a "butterfly" instead of a moth. These trifling defects can easily be remedied in a second edition, and in no way impair the interest of a book of somewhat unusual character. We should add that M. Maeterlinck is himself a practical bee-keeper (as well as an eminent man of literature), and has therefore the advantage of an acquaintance at first-hand with the general subject.

W. F. K.

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West African Studies. By Mary H. Kingsley. Second Edition, with Additional Chapters. Pp. xxxii + 507. (London: Macmillan and Co., Limited, 1901.) Price 7s. 6d.

WE are glad that a popular edition of the late Miss Kingsley's "West African Studies" has been issued at a price which puts it within the reach of the humblest student; for, as we pointed out in our review of the first edition some twelve months ago, the book is worthy of the widest and closest study not only by students of primitive religion, but also by all those who have the interest of our West African colonies at heart. Before she started for South Africa Miss Kingsley had arranged to issue this edition, and though she did not live to see it through the press, the task of editing the volume has been completed by Mr. George Macmillan on the lines already approved by her. The new edition differs from the old by the omission of the appendices by the Comte de Cardi and Mr. John Harford, which, when once on record, are always accessible to the student, while their absence of general interest would have hardly justified their inclusion in the present reprint. In their place room has thus been found for a number of lectures and magazine articles which Miss Kingsley delivered and wrote shortly before her death. The new matter includes her Hibbert lecture on "African Law and Religion," some articles on "Property in West Africa," reprinted from the *Morning Post*, and two lectures on Imperialism in general and "Imperialism in West Africa." The bulk of the volume has been reprinted in its original form.

Mr. George Macmillan has prefixed an interesting introductory notice to the second edition, in the course of which he sketches the circumstances which led Miss Kingsley to undertake the researches which will always identify her name with West Africa; at the same time he gives a brief sketch of her character. We cannot refrain from quoting one passage, which seems to us to explain her personality more concisely and more truly than any other appreciation of her that we have yet seen.

"Not long after her death a friend who knew her well, a man qualified to speak by long experience of men and affairs, summed up the rare combination of overflowing sympathy and intellectual grasp which constituted at once the power and the charm of Mary Kingsley by saying that 'she had the brain of a man and the heart of a woman.' Speaking of her time in West Africa, she herself said, on one occasion, that she was 'doing odd jobs, and trying to understand things!' The phrase was characteristically modest, but here again we see how the heart which inspired the 'jobs,' which were always for some one else's benefit, worked deliberately in concert with the brain which was ever 'trying to understand things.' Together the two phrases strike the keynote of her life."

The Use of Words in Reasoning. By Alfred Sidgwick. Pp. xi + 370. (London: Adam and Charles Black 1901.) 7s. 6d. net.

THE name of Mr. Alfred Sidgwick is a sufficient guarantee that this book will be of value to all who are genuinely interested in the processes of reasoning, and desire, without plunging into the shadowy land where logic merges itself in metaphysical speculation, to extend their research somewhat further than a study of the formal logic of the schools will take them. The old-fashioned formal logic, "Pass Mods" logic, is, in fact, of little use except as a mental discipline for University passmen; others will hardly find in the ancient jingle of *Barbara Celarent Darii Ferioque priors*, with its many combinations and permutations, a sufficient explanation of all the phenomena of reasoning. As Mr. Sidgwick says (p. 338): "Logic . . . might really quicken our sense of bad reasoning; but what formal logic does is only to quicken it in the least interesting and important